TOSHIBA

Field Intelligent Device Series

Electromagnetic Flowmeter

LF410 /LF600
LF410 /LF602
15 to 200 mm (1/2" to 8")

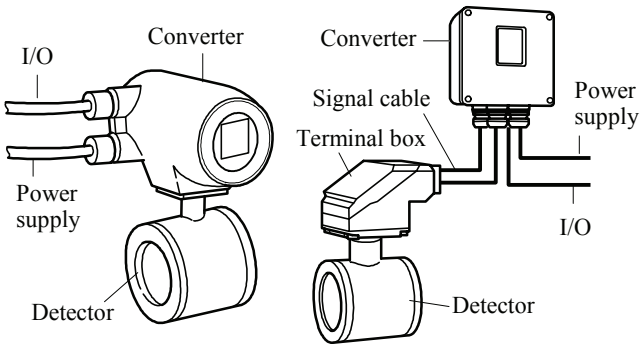
Introduction

The electromagnetic flowmeter uses Faraday's Law of electromagnetic induction to measure the process flow. The device consists of two units: a detector, through which the fluid to be measured flows and in which low-level signals proportional to flow rates are obtained; and a converter, which supplies excitation current to the detector, and amplifies the signals from the detector and then processes and converts the signals into the 4–20mAdc current signal or communication signal. Thanks to the unique patented magnetic field distribution technology, the meter is highly immune for upstream flow disturbances. Combined with multi-functional converter LF600 (combined type) or LF602 (separate type) equipped with its original noise-suppression circuit and arithmetic operation capability, LF410 has high tolerance to noise, giving stable output even for slurry fluid measurement. IR (Infrared) switches enable parameter setting of the converter without removing the cover. Flow direction can be set in either way, and its 128 x 128 dot matrix LCD display allows the LCD rotated to 90, 180 and 270 degrees with a software.

The AF900 hand-held terminal (HART*[1] communicator) can be used to communicate with the flowmeter from a remote place. PROFIBUS-PA*[2] interface is available as option.

*1: HART protocol (Highway Addressable Remote Transducer) is a communication protocol for industrial sensors recommended by the HCF (HART Communication Foundation).

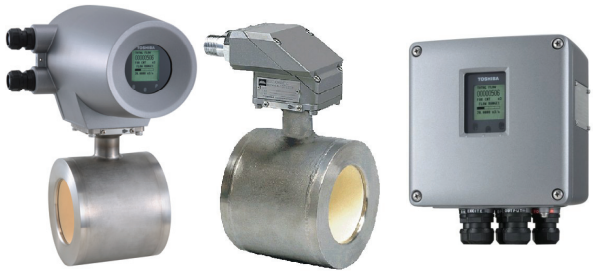
*2: PROFIBUS is the communication protocol for the factory automation and process automation that PROFIBUS Organization recommends. Instead of analog control with a conventional analog signal (4-20mA), it is one kind of the fieldbus which digitized all signals. Flowmeters support PROFIBUS-PA.



Combined type
LF410/LF600
LF414/LF600

Separate type
LF410/LF602
LF414/LF602

Figure1. Configuration



LF410/LF600
LF414/LF600

LF410
LF414

LF602

Figure2. LF410 series Flowmeters

CE *3 FM C US APPROVED

Tested by PROFIBUS Center Netherlands

Certification number
Z01207

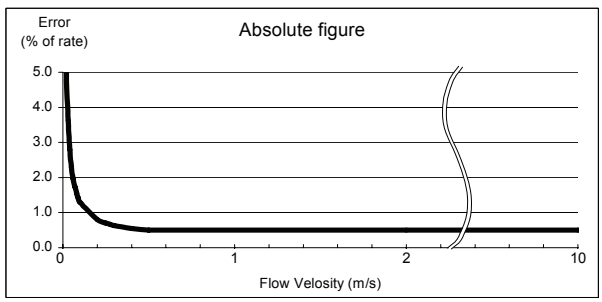
Specifications

■ Overall Specifications

Measurement range in terms of flow velocity:
0 – 0.3 m/s to 0 – 10 m/s (0 – 1.0 ft/s to 0 – 32.8 ft/s).
0 – 0.1 m/s to 0 – 0.3 m/s (0 – 0.3 ft/s to 0 – 1.0 ft/s) range is available optionally.

Accuracy: See the following graph.
Pulse output:
Vs > 0.5 m/s (1.64 ft/s): +/-0.5 % of rate.
Vs < 0.5 m/s (1.64 ft/s): +/-0.3% of rate
+/- 1 mm/s (0.039 inch/s).
Current output: plus +/-8 uA (0.05 % of span)

Note: Span = Range in the magmeters.



Accuracy

Note: The accuracy above is measured under standard operating conditions using the weighing method at Toshiba's flow calibration facility.

*3: CE mark is under application.

Fluid conductivity: 5μS/cm minimum

Fluid temperature:

−10 to +180°C : Ceramic type
(14 to 356 °F)

Note : 120°C (248°F) above is separate type

−10 to +120°C : tefolon PFA

(14 to 248°F)

Ambient temperature:

Without cFMus Approval:

−20 to +60 ℃ (−4 to 140 °F)

With cFMus Approval:

-10 to +45℃ (14 to 113 °F)

Structure: NEMA 4X (IP 67) Watertight

Power consumption:

17W(27VA) or less

19W(29VA) or less (with PROFIBUS)

Conformance to European Community Directives:

EMC directive 89/336/EEC
The low voltage 93/68/EEC
PED 97/23/EC (Note 1)

Note : See table 2 for detail.

Approved hazardous location certifications:

Model: LF414/LF600 and LF414/LF602

cFMus explosion proof:
FM Class I, Division 2, Groups A,B,C, and D.
FM Class II, Division 2, Groups E, F and G.
FM Class III.

Detector and converter combination:

LF410/LF600: Combined type for standard specification.

LF410/LF602: Separate type for standard specification.

LF414/LF600: Combined type with Ex approval of Class I, Division 2 (cFMus).

LF414/LF602: Separate type with Ex approval of Class I, Division 2 (cFMus).

■ Model LF410 and LF414 Detectors

Mounting style: Wafer type

Fluid pressure: −0.1 to 2.0MPa
(−15 to 300psi, or −1.0 to 20 bar)

Note: The test pressure before shipping from the factory is equal to twice the nominal pressure rating of the customer specified flange connection during 15 minutes.

Connection flange standards: ANSI 150, ANSI 300, BS10 and 16, DIN PN10 and PN16, JIS10K, JIS16K and JIS20K

Principal materials:

Case — 25 to 100mm (1" to 4"): stainless steel 15, 150, and 200mm (1/2", 6", and 8"): carbon steel

Linings — 15 to 100mm (1/2" to 4"): Ceramic tube (std.) & teflon PFA (opt.)

150 and 200mm (6" to 8"): teflon PFA

Electrodes — 316L stainless steel (std.)

Grounding rings — 316 stainless steel (std.)

Note: See Table 3 for optional materials and other related information.

Measuring tube material — 304 stainless steel (in case of Teflon PFA lining)

Coating — 25 to 100mm (1" to 4"): no coating (stainless steel body).
15, 150, and 200mm (1/2", 6", and 8"): phthalic acid resin coating with pearl-gray colored.

Heat shock resistance : for a ceramic tube detector

Heating: $\Delta T \leq 150$ °C/0.5sec (302°F/0.5sec)

Cooling: $\Delta T \leq 100$ °C/0.5sec (212°F/0.5sec)

Note: The above means that the ceramic tube detector withstands the shock of sudden heating (temperature difference 150°C or less per 0.5seconds) and sudden cooling (temperature difference 100°C or less per 0.5seconds).

Dimensions and weights: See Figures 3 to 8.

Cable connection port: for separate type detectors.

Cable glands —

LF410: without cFMus approval
Provided as standard
R(PT) 1/2 male screws.

LF414: with cFMus approval
Not provided
3/4-14NPT male screws are required.

Applicable diameter — 11 to 13mm
(0.433 to 0.512 inch)

■ Model LF600 and LF602 converters

Input signals

Analog signal — the voltage signal from detector, proportional to process flow rate (for LF602 separate type converter).

Digital input DI (opt.)
Signal type: 20 to 30Vdc voltage signal
Input resistance: 2.7kΩ
Number of inputs: one point

DI function — One of the following functions can be assigned to the optional DI signal.

Range switching — Selects either the higher or lower range in the unidirectional or bidirectional 2-range setting.

Totalizer control — Starts and stops the built-in

totalizer.

Fixed-value outputs — Outputs fixed-values for current and pulse outputs.

Zero adjustment — Executes zero adjustment (on-stream at zero flow rate).

Output signals

Current output:
4–20mAdc (load resistance 0 to 750Ω)

Note: The current output cannot be used with the PROFIBUS-PA ccommunication.

Digital outputs — One point (std.) and one more point is optionally available as follows.

Digital output DO1 (std.):
Output type: Transistor open collector
Number of outputs: One point
Output capacity: 30Vdc, 200mA maximum

Digital output DO2 (opt.):
Output type: Solidstate relay output (non polarity)
Number of outputs: One point
Output capacity: 150Vdc, 150mA maximum or 150 V ac (peak to peak), 100mA maximum

DO1 and DO2 functions — One of the following functions can be assigned to DO1 (std.) and/or DO2 (opt.)

- **Pulse output (available only for DO1,DO2)**
  Pulse rate: 3.6 to 36,000,000 pulses/hr (DO1)
  3.6 to 360,000 pulses/hr (DO2)
  (Over 3,600,000 pulses/hr, auto-setting)
  Pulse width: 0.5 to 500ms (but less than half of the period for 100% flow rate)
  Note: The same and simultaneous pulse is not available between DO1 and DO2.)
- **Multi-range selection outputs (Note 1)**
- **High, High high, Low, and/or Low low alarm outputs (Note 2)**
- **Empty pipe alarm output**
- **Digital Output Active Status (DO1 and DO2) (Note 2)**
- **Preset count output**
- **Converter failure alarm output**

Note 1: Two outputs (DO1 and DO2) are needed for 4-range switching and forward/reverse 2-range switching.

Note 2: Normal Open (default set) or Normal Close is selected for alarm outputs when programming.
The Status when power failure is kept to Normal Open.

Communications output :

- **HART(std.)**
  Digital signal is superimposed on 4–20mAdc current signal as follows:
- **Conforms to HART protocol**
  Load resistance: 240 to 750Ω
  Load capacitance: 0.25μF maximum
  Load inductance: 4mH maximum

- **PROFIBUS (opt.)**
  Protocol : PROFIBUS-PA
  Baurate : 31.25kbps
  Bus voltage : 9-30Vdc
  Consumption electric current of bus:less than 16mA
  Manufacture Ident-No. : $093B_{HEX}$
  Standard Ident-No. : 9740_{HEX}
  Slave address : 0-126 (Default address is 126)
  Profile : Profile Ver.3.01 for Process Control Devices
  Function blocks : AI(Flow)×1 , Totalizer×1

LCD display: Full dot-matrix 128×128 dot LCD display (back-light provided)
The data on the LCD inside the converter can rotate to 90, 180, and 270 degrees by a software, without rotating the indicator itself. (Combined type only)

Parameter settings — Parameters can be set as follows:

- **IR Switches**: Three key switches are provided to set configuration parameters.
- **Digital communication**: The AF900 hand-held terminal or PROFIBUS is needed to set parameters.
- **Zero adjustment:** Zero point adjustment can be started by pressing the switch in the converter.

Damping: 0.5 to 60 seconds (selectable in 1 second increments)

Zero and span calibration: Built-in calibration signal source allows converter unit check.

Conditions when power fails: The outputs and display will remain as follows when power fails. Parameter setting values are stored in non-volatile memory and the values will be restored when the power returns to normal condition.

- Current output: 0mAdc
- Digital output: OFF
- LCD display: No display
- PROFIBUS: No communication

Power supply: One of the following can be selected:

- 100 to 240Vac, 50/60Hz (std.) (allowable voltage 80 to 264Vac)
- 24Vdc (allowable voltage 18 to 36Vdc)
- 110Vdc (allowable voltage 90 to 130Vdc)

Surge protection: Arresters are installed in the power supply, and current signal output circuit.

Case: Aluminum alloy (equivalent of IP 67)

Coating: Acrylic resin-baked coating, pearl-gray colored

Cable connection ports:

Cable glands —

LF600 and LF602 without cFMus Approval:
Provided as standard
OD of cable ϕ 11~13mm
Material Nylon 66
G (PF) 1/2 male screws.

Note: When PROFIBUS option is specified , cable grands size is ϕ 6~8mm for signal cable, ϕ 11~13mm for power cable.

LF600 and LF602 with cFMus Approval:
Not provided, 1/2-14NPT male screws are required.

Applicable diameter — 11 to 13mm
(0.433 to 0.512 inch)

Vibration resistance:

No resonance to the following levels of vibration:

- 10 to 150Hz with acceleration of 9.8m/s^2

No defect in putting vibration to each direction of 30Hz with 29.4 m/s^{2}in 4h.

Note: Avoid using the flowmeter in an environment with constant vibration.

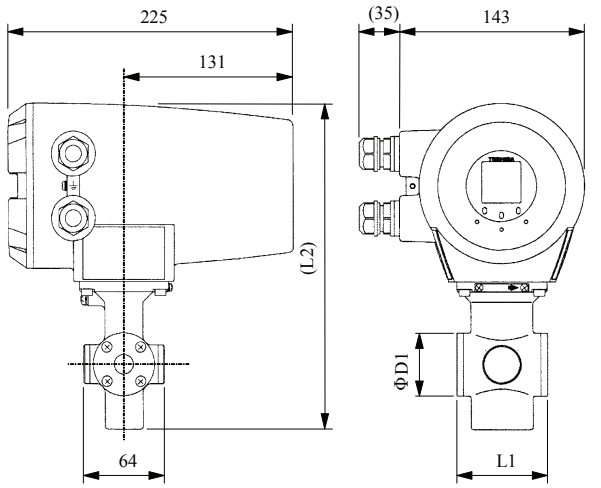
Converter LF602 dimensions and weights:
See Figure 9 (for Separate type)

MTBF:220,000 hours at 25 deg.C (77 deg.F) based on MIL-HDBK-217F

Installation

■ Dimensions

Unit : mm



BS16, DIN PN16 and JIS 10K dimensions:

Meter size (mm)	L1 (mm)	L2 (mm)	D1 (mm)	Weight (kg)
15	70	252	49	approx. 5

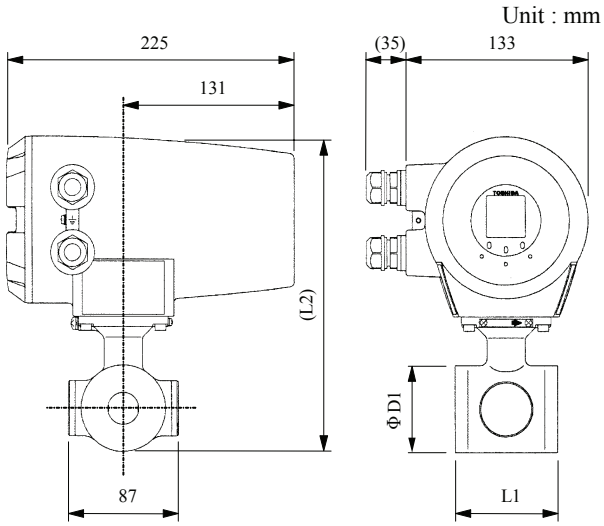
Note: 1 inch = 25.4mm

ANSI class 150 and class 300 dimensions:

Meter size (inch)	L1 (inch)	L2 (inch)	D1 (inch)	Weight (lb)
1/2	2.76	9.92	1.93	approx. 11

Figure 3. LF410/LF600 and LF414/LF600 flowmeters Meter size 15mm (1/2")

Unit : mm



BS16, DIN PN16 and JIS 10K dimensions:

Meter size (mm)	L1 (mm)	L2 (mm)	D1 (mm)	Weight (kg)
25	80	241	66	approx. 5

Note: 1 inch = 25.4mm

ANSI class 150 and class 300 dimensions:

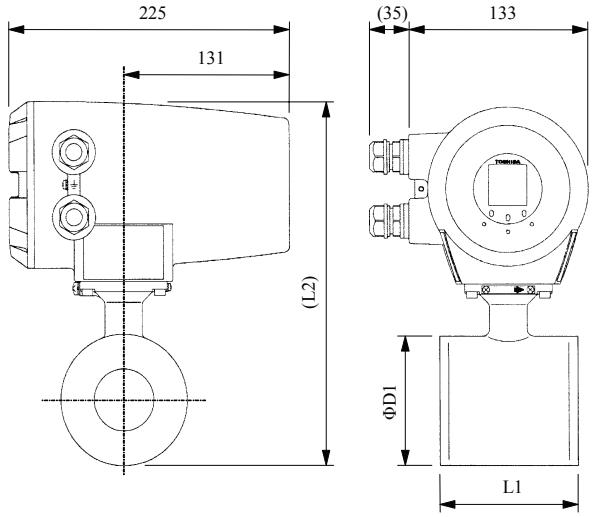
Meter size (inch)	L1 (inch)	L2 (inch)	D1 (inch)	Weight (lb)
1	3.15	9.48	2.60	approx. 11

Figure 4. LF410/LF600 and LF414/LF600 flowmeters Meter size 25mm (1")

The dimension of L1 is changed when the material of grounding ring is chosen Pt-Ir or Ta.

Meter size	L1
15mm (1/2”)	77mm (3.03 inch)
25mm (1”)	95mm (3.74 inch)
40mm (1 1/2”)	115mm (4.53 inch)
50mm (2”)	126mm (4.96 inch)
80mm (3”)	126mm (4.96 inch)
100mm (4”)	136mm (5.35 inch)
150mm (6”)	242mm (9.53 inch)
200mm (8”)	312mm (12.28 inch)

Unit : mm



Note1: Eye bolts are provided at the top for flowmeters sized 200mm (8").

BS16, DIN PN16 and JIS 10K dimensions

Meter size (mm)	L1 (mm)	L2 (mm)	D1 (mm)	Weight (kg)
40	100	264	85	approx. 6
50	110	280	102	approx. 7
80	110*	306	127	approx. 8
100	120*	338	159	approx. 10
150	230	407	216	approx. 22
200	300	458	267	approx. 32

ANSI class 150 and class 300 dimensions

Meter size (inch)	L1 (inch)	L2 (inch)	D1 (inch)	Weight (lbs)
1-1/2	3.94	10.39	3.35	approx. 13
2	4.33	11.02	4.02	approx. 15
3	4.33*	12.04	5.00	approx. 18
4	4.72*	13.30	6.26	approx. 22
6	9.06	16.02	8.50	approx. 49
8	11.81	18.03	10.51	approx. 70

Note: 1 inch = 25.4mm

*When Teflon PFA lining is selected, L1 in the table above becomes as follows:

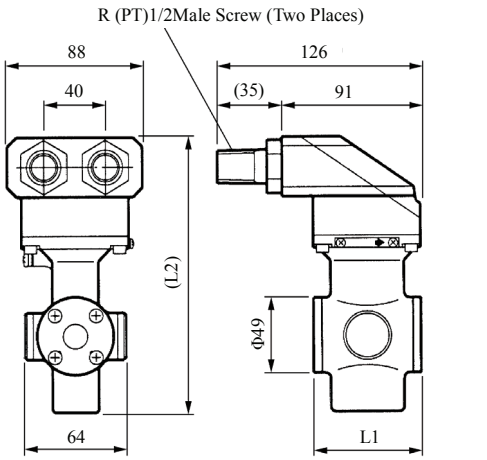
- L1: 115mm (4.53 inch) for meter size 80mm (3")
- L1: 126mm (4.96 inch) for meter size 100mm (4")

Figure 5. LF410/LF600 and LF414/LF600 flowmeters Meter sizes 40 (1 1/2") to 200mm (8")

The dimension of L1 is changed when the material of grounding ring is chosen Pt-Ir or Ta

Meter size	L1
15mm (1/2")	77mm (3.03 inch)
25mm (1")	95mm (3.74 inch)
40mm (1 1/2")	115mm (4.53 inch)
50mm (2")	126mm (4.96 inch)
80mm (3")	126mm (4.96 inch)
100mm (4")	136mm (5.35 inch)
150mm (6")	242mm (9.53 inch)
200mm (8")	312mm (12.28 inch)

Unit : mm



Note1: Cable glands are not provided for LF414 of FM and CSA approved type.
Refer to the part of Cable connection port at detector.

Note2: 1 inch = 25.4mm

BS16, DIN PN16 and JIS 10K dimensions:

Meter size (mm)	L1 (mm)	L2 (mm)	D1 (mm)	Weight (kg)
15	70	179	49	approx. 3

ANSI class 150 and class 300 dimensions:

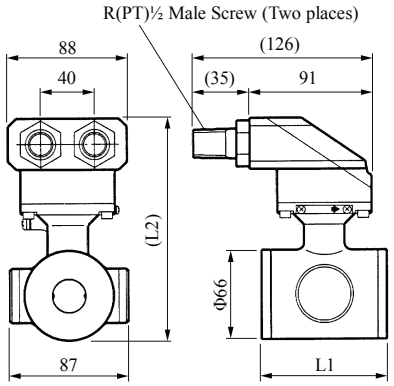
Meter size (inch)	L1 (inch)	L2 (inch)	D1 (inch)	Weight (lb)
1/2	2.76	7.05	1.93	approx. 7

Figure 6. Separate type detectors LF410 and LF414 Meter size 15mm (1/2")

The dimension of L1 is changed when the material of grounding ring is chosen Pt-Ir or Ta

Meter size	L1
15mm (1/2")	77mm (3.03 inch)
25mm (1")	95mm (3.74 inch)
40mm (1 1/2")	115mm (4.53 inch)
50mm (2")	126mm (4.96 inch)
80mm (3")	126mm (4.96 inch)
100mm (4")	136mm (5.35 inch)
150mm (6")	242mm (9.53 inch)
200mm (8")	312mm (12.28 inch)

Unit : mm



Note1: Cable glands are not provided for LF414 of FM and CSA approved type.
Refer to the part Cable connection port at detector.
Note2: 1 inch = 25.4mm

BS16, DIN PN16 and JIS 10K dimensions:

Meter size (mm)	L1 (mm)	L2 (mm)	D1 (mm)	Weight (kg)
25	80	168	66	approx. 3

ANSI class 150 and class 300 dimensions:

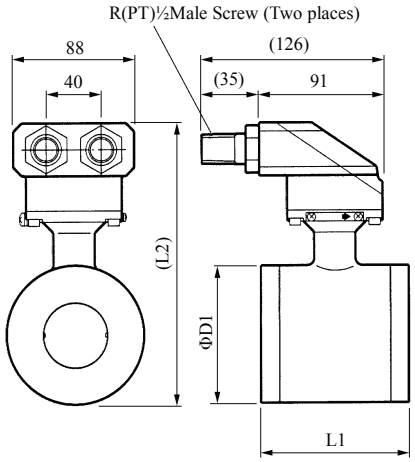
Meter size (inch)	L1 (inch)	L2 (inch)	D1 (inch)	Weight (lb)
1	3.15	6.61	2.60	approx. 7

Figure 7. Separate type detectors LF410 and LF414 Meter size 25mm (1")

The dimension of L1 is changed when the material of grounding ring is chosen Pt-Ir or Ta

Meter size	L1
15mm (1/2")	77mm (3.03 inch)
25mm (1")	95mm (3.74 inch)
40mm (1 1/2")	115mm (4.53 inch)
50mm (2")	126mm (4.96 inch)
80mm (3")	126mm (4.96 inch)
100mm (4")	136mm (5.35 inch)
150mm (6")	242mm (9.53 inch)
200mm (8")	312mm (12.28 inch)

Unit : mm



Note1: Cable glands are not provided for LF414 of FM and CSA approved type.
Refer to the part of Cable connection port at detector.
Note2: Eye bolts are provided at the top for flowmeters sized 200mm (8").
Note3: 1 inch = 25.4mm

BS16, DIN PN16 and JIS 10K dimensions:

Meter size (mm)	L1 (mm)	L2 (mm)	D1 (mm)	Weight (kg)
40	100	190	85	approx. 4
50	110	207	102	approx. 5
80	110*	232	127	approx. 6
100	120*	264	159	approx. 9
150	230	324	216	approx. 21
200	300	385	267	approx. 35

ANSI class 150 and class 300 dimensions:

Meter size (inch)	L1 (inch)	L2 (inch)	D1 (inch)	Weight (lbs)
1-1/2	3.94	7.48	3.35	approx. 9
2	4.33	8.15	4.02	approx. 11
3	4.33*	9.13	5.00	approx. 13
4	4.72*	10.39	6.26	approx. 20
6	9.06	12.76	8.50	approx. 47
8	11.81	15.16	10.51	approx. 78

* When Teflon PFA lining is selected, L1 in the table above becomes as follows:
·L1: 115mm (4.53 inch) for meter size 80mm (3")
·L1: 126mm (4.96 inch) for meter size 100mm (4")

Figure 8. Separate type detectors LF410 and LF414 Meter size 40 (1 1/2") to 200mm (8")

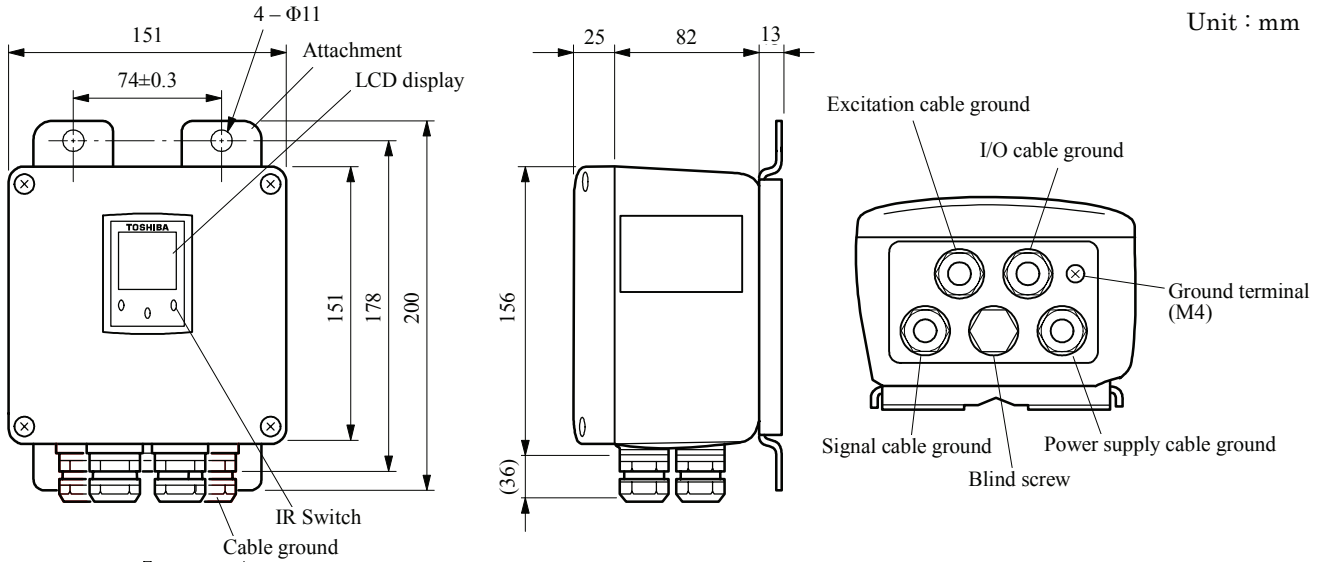
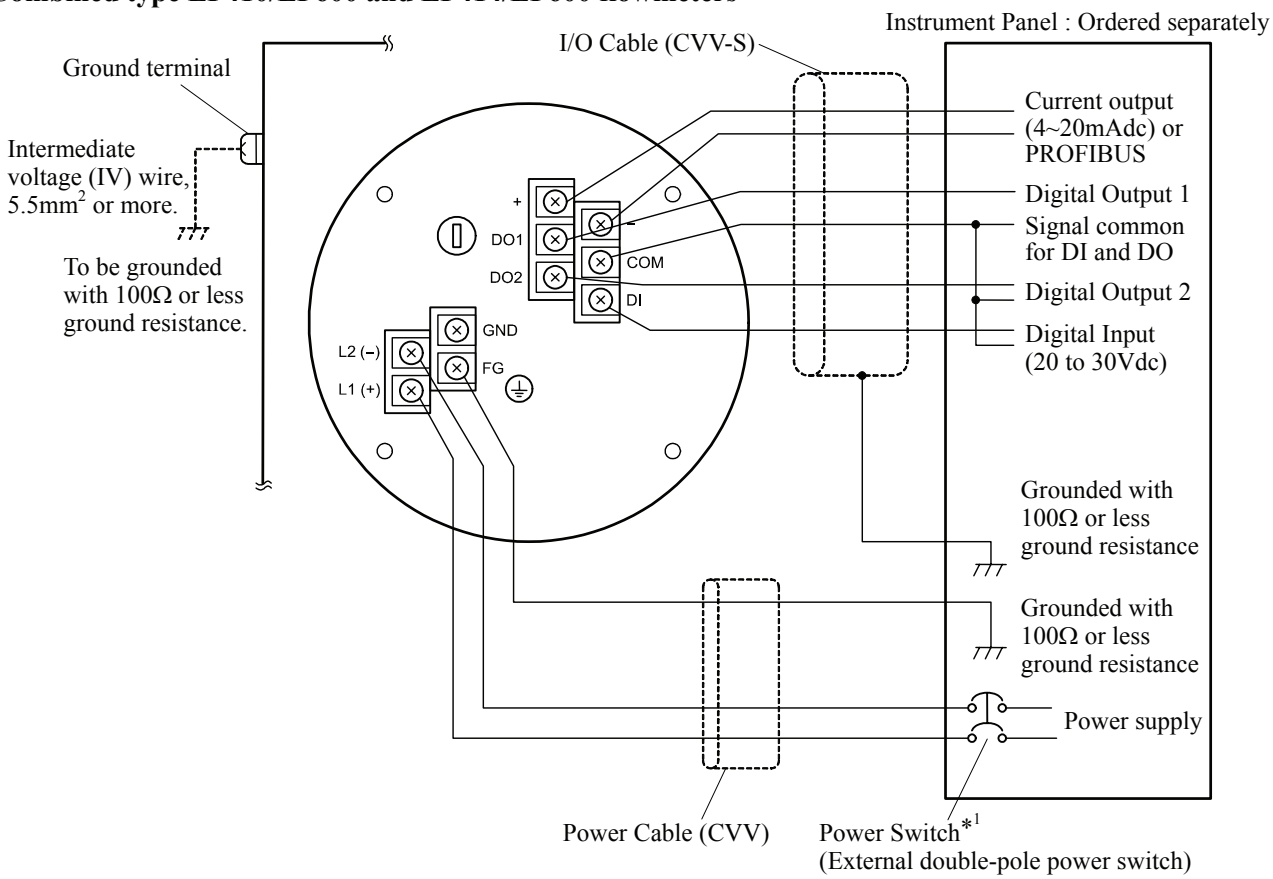


Figure 9. Separate type converter LF602

■ External Connections

• Combined type LF410/LF600 and LF414/LF600 flowmeters

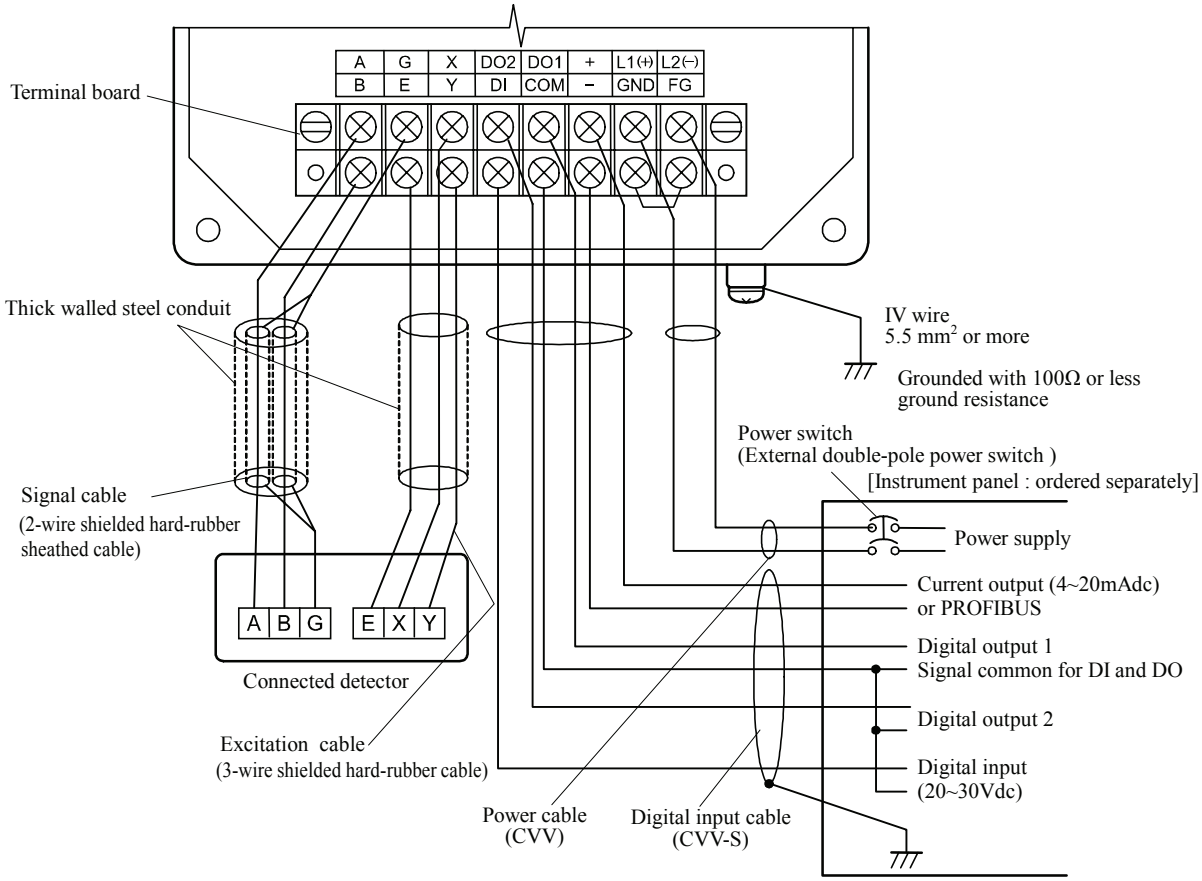


***1** Locate an external double-pole power switch on the power line near the flowmeter within easy reach of operation. Use the appropriate switch rating as shown below:

Switch rating: 250Vac, 6A or more
In rush current: 15A or more

Figure 10. Combined type LF410/LF600 and LF414/LF600 flowmeters Wiring Diagram

<Separate type LF410/LF602 and LF414/LF602 flowmeters>



Symbol	Description	Cable
L1 (+)	Power supply	Power cable (CVV)
L2 (−)		
GND	Ground (for arrester)	
FG	Frame ground	
DI	Digital Input (20～30Vdc)	I/O cable (CVV-S)
DO1	Digital Output 1	
DO2	Digital Output 2	
COM	Signal Common for DI, DO1, DO2	
+	Current Output (4～20mAdc) or PROFIBUS	
−		Shielded cable for PROFIBUS-PA
X	Excitation Output	Excitation cable (for LF602 only)
Y		
E		
A	Signal Input	Signal cable (for LF602 only)
B		
G		

Figure 11. Separate type LF410/LF602 and LF414/LF602 flowmeters wiring Diagram

■ Wiring Precautions

(1) Explosion proof type flowmeters are not provided cable glands.
Refer to the part Cable connection port at detector and converter.

(2) Connect the grounding wire (IV wire 5.5mm² or more) to a good earth ground (100Ω or less ground resistance). Make the wire as short as possible. Do not use a common ground shared with other equipment where earth current may flow. An independent earth ground is recommended.

(3) The allowable cable lengths between the detector and converter for the separate type flowmeter depend on the electrical conductivity of the object fluid. See Figure 12 below.

(4) DO1, DO2 (opt.), and DI (opt.) use the same common terminal (COM). This COM can not connect to other equipments which have their own ground terminal.
(Power supply for connecting to DI or DO, etc…) Need to wire separately.

■ Wiring Precautions (PROFIBUS)

(1) For wiring path, avoid places near electrical equipment that may cause electromagnetic induction or electrostatic induction interference (such as a motor, transformer and wireless transmitter).

(2) Use a PROFIBUS-PA cable for signal cable. In addition, make sure to use a shielded cable to improve noise resistance. Furthermore, installation of signal cable in metal conduit is recommended.

(3) General PROFIBUS-PA cables are designed for indoor use where cables are not exposed to humidity, rain, etc. When you install cables, make sure to check the operating conditions such as the operating temperature range of the cable by contacting its manufacturer.

(4) When you carry out cable end treatment of PROFIBUS-PA cable, use a dedicated cable stripper etc. so that the core wire of the cable will not be nicked or damaged. In addition, for cables, be careful of allowable maximum bend diameter etc. (Basically, do not install cables in a way cables are twisted or bent.).

(5) Consider installing a PROFIBUS-PA arrester in the communication path of PROFBUS-PA so that the electromagnetic flowmeter will not be affected by lightning etc.

(6) The electromagnetic flowmeter is not equipped with terminating resistors.Use the terminating resistor unit for PROFIBUS-PA or junction box, if necessary.

(7) Only one PROFIBUS-PA cable goes through a cable gland of the Electromagnetic Flowmeter. Please use the junction box at system configuration.

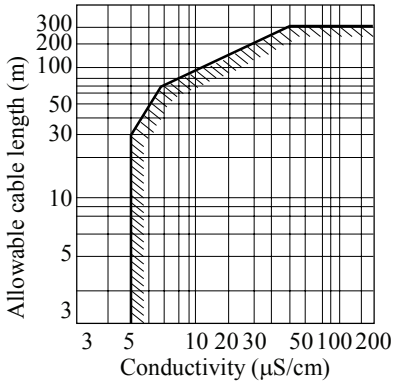


Figure 12. Electrical Conductivity and Cable Length

■ Piping Precautions

(1) Design piping so that the flowmeter detector pipe is always filled with the fluid being measured, whether the fluid is flowing or not.
(2)The detector has no adjustable piping mechanism. Install an adjustable short pipe where needed.
(3) The required straight pipe length should comply with the requirements as follows.
(4) Be sure to grounding the flowmeter according to below figure.

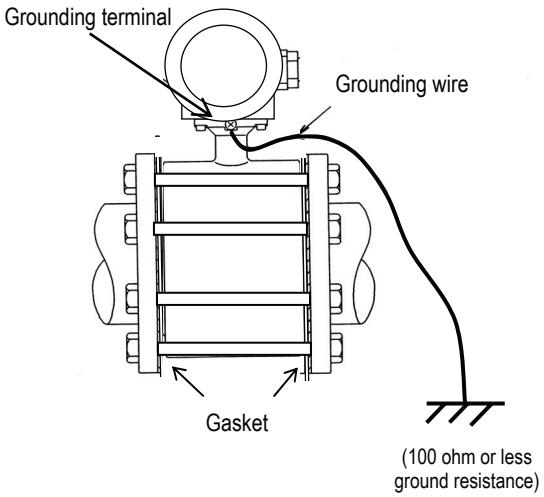
Upstream side	When using a 90°bent, Tee, diffuser, or fully opened valve	L≧5D
	When using other types of valves	L≧10D
Downstream side	When no valve plate protrudes into the detector pipe	L≧0

L:Required straight pipe length

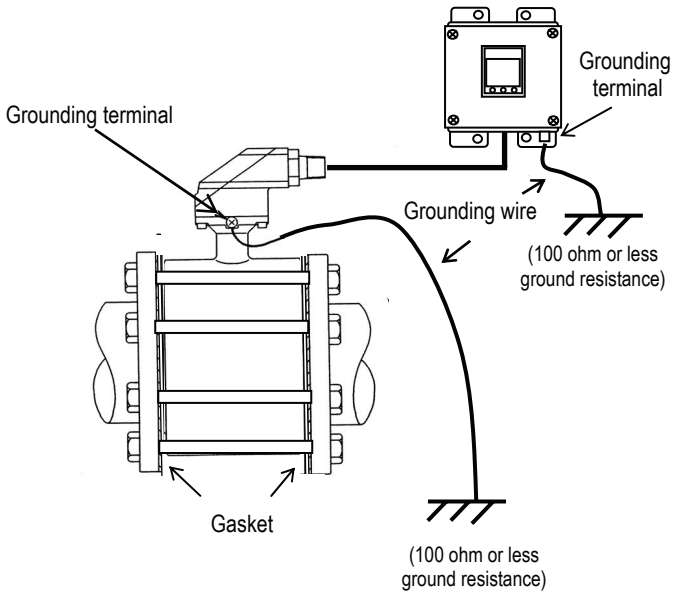
D:Meter size

Grounding of the Combined type and Separate type

Combined type



Separate type

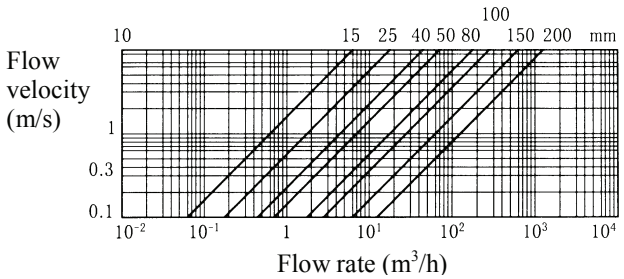


■ Meter Size

To select the meter size:

See Figure 13 and find meter sizes within the velocity of 0.1 to 10m/s for a specified full-scale (measuring range high limit) flow. Select one that has its full-scale velocity between 1 and 3m/s.

Note: Make sure the full-scale flow rate used for the final planning stage stays within 10m/s in terms of flow velocity.



For SI unit Unit: m^3/h

Meter size (mm)	Flow rate		
	0.3 m/s	1 m/s	10 m/s
15	0.1908	0.6361	6.361
25	0.5301	1.767	17.67
40	1.357	4.523	45.23
50	2.120	7.067	70.67
80	5.428	18.09	180.9
100	8.482	28.27	282.7
150	19.08	63.61	636.1
200	33.93	113.1	1131

For English unit Unit: gal/min

Meter size (inch)	Flow rate		
	0.98ft/s	3.28ft/s	32.8ft/s
1/2	0.8401	2.801	28.01
1	2.334	7.780	77.80
1 1/2	5.975	19.91	199.1
2	9.334	31.12	311.2
3	23.90	79.65	796.5
4	37.35	124.5	1,245
6	84.01	280.1	2,801
8	149.4	498.0	4,980

Figure 13. Flow Rate and Flow Velocity

■ Calibration Range

If the calibration range is not specified, the standard range as shown below will be used. If the range is specified, we will use the specified range for calibration.

Table 1. Standard Flow Range

Meter size mm (inch)	Standard flow range		
	Flow rate (m^3/h)	Flow velocity (m/s)	Flow rate (gal/min)
15 (1/2)	2	3.144	25
25 (1)	6	3.395	75
40 (1 1/2)	15	3.316	175
50 (2)	25	3.537	300
80 (3)	60	3.316	650
100 (4)	100	3.537	1,000
150 (6)	200	3.144	2,500
200 (8)	300	2.653	4,500

Note: The unit of "gal/min" is not exchanged (converted) by "m^3/h".

■ PED matrix in each flange connection.

The following sizes fall under the category for PED in each flange connection when the meter ships to EU. All of them had complied with it from a notified body.

Table 2 PED matrix in each flange connection

Flange standard	Meter size
DIN PN 16 and BS 16	150 to 400mm (6 to 16 inch)
DIN PN 10 and BS 10	250 to 400mm (10 to 16 inch)
ANSI 150 and JIS10K	6 to 16 inch (150 to 400mm)

■ About establishment environment

Do not store or install the flowmeter in:

- Places where there is direct sunlight.
- Places where excessive vibration or mechanical shock occurs.
- Places where high temperature or high humidity conditions obtain.
- Places where corrosive atmospheres obtain.
- Places submerged under water.
- Place where there is slop floor. To put the flowmeter temporarily on the floor, place it carefully with something, such as stopper, to support it so that the flowmeter will not topple over.

In places like the following places, there is the case that infrared switches do not function correctly. (If this is unavoidable, use an appropriate cover.

- •Places where gets very bright light onto operation panel. (direct sunlight, reflection light of sunlight by windowpanes, diffused reflection light of strength etc.)
- •Places where smoke and steam occur near.
- •Places where a snow, ice or mud that may attached.

Ordering Information

1. When ordering the LF410 series flowmeters, refer to Tables 3 and 4 (Type Specification Codes). An entry must be made for each of the columns in each of these tables.
2. Fluid characteristics:
   (1) Type of fluid to be measured and its characteristics
   (2) Fluid temperature
   (3) Fluid pressure
   (4) Electrical conductivity of the fluid
3. Measuring range
4. I/O function setting
5. Ordering scope:
   Flow calibration data: (required or not)
6. Other items
   Specifications other than standard items

Consult Toshiba representative before ordering when choose materials of the wetting parts such as lining, electrodes, and grounding rings.

Table 3. Specification Code (Wafer type detector LF410 Series)

Model					Specification Code									Description	Detector category			
															Normal type		Ex. type	
1	2	3	4	5	6	7	8	9	10	11	12	13	14		Gr.-A	Gr.-B	Gr.-C	Gr.-D
L	F	4	1	0										Normal specification type	√	√		
L	F	4	1	4										Hazardous location certification type (Note 1)			√	√
														Meter size				
					D									15mm (½")	√		√	
					E									25mm (1")	√		√	
					F									40mm (1½")	√		√	
					G									50mm (2")	√		√	
					H									80mm (3")	√		√	
					J									100mm (4")	√		√	
					K									150mm (6")		√		√
					L									200mm (8")		√		√
														Mounting Style				
						L								Detector/Converter combined type (LF410/LF600)	√	√		
						M								Detector/Converter separate type (LF410/LF602)	√	√		
						P								Detector/Converter combined type with PED (LF410/LF600) (Note 6)	√	√		
						Q								Detector/Converter separate type with PED (LF410/LF602) (Note 6)	√	√		
														FM and CSA Class - I Division 2 type (Note 1)				
						A								Detector/Converter combined type (LF414/LF600)			√	√
						B								Detector/Converter separate type (LF414/LF602)			√	√
														Connection flange standard (Note 2)				
							C							ANSI 150	●	●	●	●
							D							ANSI 300	●	●	●	●
							E							BS PN 10	●	●	●	●
							F							BS PN 16	●	●	●	●
							G							DIN PN 10	●	●	●	●
							H							DIN PN 16	●	●	●	●
							J							JIS 10K	●	●	●	●
							K							JIS 16K	●	●	●	●
							L							JIS 20K	●	●	●	●
							Z							other	○	○	–	–
														Electrode Material (Note 6)				
								B						316L stainless steel	●	●	●	●
								C						Ti (titanium)	○	○	○	○
								D						Pt-Ir (platinum/iridium)	○	○	○	○
								E						Ta (tantalum)	○	○	○	○
								F						Hastelloy C (Equivalent)	○	○	○	○
								Z						other	○	○	–	–
														Lining Material (Note 6)				
									A					Alkali-resistant ceramic (Note 3)	●	–	●	–
									B					Acid-resistant ceramic (Note 3)	●	–	●	–
									C					Teflon PFA	○	●	○	●
														Grounding Ring Material (Note 6)				
										C				316 stainless steel	●	●	●	●
										D				316L stainless steel	○	○	○	○
										E				Ti (titanium)	○	○	○	○
										F				Ta (tantalum)	○	○	○	○
										G				Pt-Ir (platinum/iridium)	○	○	○	○
										H				Hastelloy C (Equivalent)	○	○	○	○
										Z				other	○	○	–	–
														Flow and calibration velocity range				
											A			0.3 to 10 m/s (standard range calibration)	●	●	●	●
											B			0.3 to 10 m/s (specified range calibration)	○	○	○	○
											C			0.1 to 10 m/s (specified range calibration)	○	○	○	○
														Excitation and Signal Cables				
												A		not provided	●	●	●	●
												B		30m cable, provided (Note 4)	○	○	○	○
												C		other lengths, provided (Note 4)	○	○	○	○
														Coating				
													A	no coating	●	–	●	–
													B	phthalic acid resin coating pearl-gray colored (Note 5)	○	●	○	●
													C	black tar epoxy resin 0.3 mm	○	○	○	○
													D	black tar epoxy resin 0.5 mm	○	○	○	○
													E	Black tar epoxy resin 0.5 mm for submersible type (Note 7)	○	○	○	○

Size code explanation: √:Object ●: Standard ○: Option –: Not available

Note1: Cable glands are not provided. Refer to the part of "Cable connection port" at detector and converter.
Note2: Same shape of flange standard among ANSI 150, ANSI 300, BS10, BS16, DIN10, DIN16, JIS10K, JIS16K, and JIS20K.
Note3: The type of material used is alumina ceramic, this is suitable for both acid and alkali liquids.
This ceramic lining and the electrodes are held with seals, there are two types, one for acids, and the other for alkalis.
Note4: Separate type detector only. Specifyng the code "C", indicate the length of cables from 1 to 300m in 1 meter increments.
Note5: Phthalic acid resin coating is standard for the flowmeter with meter size 15mm(1/2"), 150mm(6"), and 200mm(8").
Note6: Consult Toshiba before ordering when choose materials at the wetting parts.
Note7: Ceramic lining only. (Teflon PFA lining is not available.)
Note8: Check the Table 2 whether your chosen meter size meets this directive or not when the meter is shipped to EU. If yes, need to choose this code.

Table 4. Specification Code for converters

Model					Specification Code									Contents	LF600 type	LF602 type
1	2	3	4	5	6	7	8	9	10	11	12	13	14			
L	F	6	0											Electromagnetic flowmeter converter		
				0										Integral (Combined) type	●	—
				2										Separate (Remote) type	—	●
					A									Purpose		
														Standard	●	●
					F									cFMus class I, Division 2 approved	○	○
						A								Shape		
														Integral type with case	●	—
						B								Separate type with case	—	●
							A							Converter mounting fitting		
														None	●	○
							C							Panel, Accessory for wall mounting (BNP material: SUS304)	—	●
							E							Accessory for pipe installation (BNP material: SUS304)	—	○
								1						Digital input/output		
														Digital output points 1 (DO1)	●	●
								2						Digital output points 2 (DO1+DO2) +Digital input point 1 (DI)	○	○
									1					Current output and Communication function		
														Current output + HART communication	●	●
									2					PROFIBUS communication (Current output is not usable)	○	○
										1				Power supply		
														100Vac-240Vac, 50/60Hz	●	●
										2				24Vdc	○	○
										3				110Vdc	○	○
											A			Instruction manual		
														Japanese	○	○
											E			English	●	●

Code explanation: ●: Standard ○: Option —: Not available

ISO9001 and ISO14001 are certified.

Misuse of this product can result in damages to property or human injury.
Read related manuals carefully before using this product.

Specifications are subject to change without notice.
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